

FISH SURVEYS CONDUCTED
ON THE
WASATCH-CACHE NATIONAL FOREST
DURING 2001

By

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INTRODUCTION

During the summer of 2001 the staff of the Wasatch-Cache National Forest, Region 4 of the Forest Service, surveyed tributaries of the Bear River, Weber River and Duchesne River drainages (Table 1). These surveys are within historic range of the Bonneville or Colorado River cutthroat trout. The main purpose was to identify fish species compositions and identify population changes from surveys conducted in 1994. Additional information acquired included population estimates for fish within the stream and age class distribution of the population (See Appendix).

METHODS

Crews started at easily identified locations on the streams and surveyed either upstream or downstream approximately 100 meters. Crews consisted of two or three people. One person ran the electro-fishing equipment and, depending on the individual, may also have assisted in netting fish. The second person netted fish while a third person also netted fish and carried a bucket to hold captured fish.

The sample sections were approximately 100 meters in length and started and ended at distinguishable habitat breaks. All possible attempts were made to locate sampling sections where a crew, in future years, could relocate and re-sample the same stream sections. A hip chain or a measuring tape would be used to determine the ending point of the 100 M section sampled. All side channels were sampled within this survey section. Fish collected within the sampling section during each pass were placed in a bucket of fresh water until weight and total length and weight could be measured. Photographs were taken of the sample site and the cutthroat trout collected at the site.

A population estimate was made for each section where possible. Some populations were not estimated because the sampling assumptions were violated. The assumptions for making population estimates are: (1) equal sampling efforts, (2) the probability of capture for any individual in the population is equal, and (3) the population is closed, no movement, deaths or births occur during or between sampling efforts (White et al. 1982). The probability of capture for any individual is also supposed to be equal between passes. Riley and Fausch (1992) found that this might not always be the case. They suggest that at least three passes be done to test capture probability. In most situations only two passes were conducted because of limited money, time and other resources.

Table 1. Fish sampling locations for streams surveyed on the Wasatch-Cache National Forest in 2001 and their UTM coordinates where sampled. Major drainages and fish species present are also identified.

Drainage Stream	Specific Location (UTM)	Fish Species
BEAR RIVER		
West Fork Bear River	506650.00M E 4523146.70M N Z 12	CT,SC
Hayden Fork (middle)	509856.41M E 4514932.86M N Z 12	CT,WF,SC,RB,BK
Hayden Fork (upper)	510339.58M E 4512308.59M N Z 12	CT,SC,BT
Stillwater Fork	514031.22M E 4523568.69M N Z 12	CT,WF,SC,MS,RB,BK
E.F. Bear West Canal	515621.26M E 4527827.36M N Z 12	CT,WF,SC,BK
E.F. Bear East Canal	516781.18M E 4526409.03M N Z 12	CT,WF,SC,BK
WEBER RIVER		
M.F. Weber River	511593.17M E 4504895.32M N Z 12	CT,SC,BK,CR
DUCHESNE RIVER		
Duchesne River	515621.26M E 4527827.36M N Z 12	RB,BK

S=South, N=North, E=East, W=West, F=Fork, Ct= Cutthroat Trout, RB=Rainbow Trout, BK=Brook Trout, CR=Cutthroat-Rainbow Cross, SC=Sculpin, WF=Whitefish, MS=Mountain Sucker

Fish populations were estimated for fish 100 mm and over. The probably, for capturing fish under 100 mm, is believed to be too low to make an accurate estimate. With electrofishing, the larger the fish, the higher the probability of capture (White et al. 1982). Fish under 50 mm were assumed to be age 0 fish. Fish from 51 to 100 mm were believed to be age 1 fish. It is realized that in many situations, because of local environmental factors, this generalization may not hold true.

The calculations used to make the population estimate was:

$$N = U1/(1-(U2/U1))$$

where

N = population estimate for the section sampled

U1 = fish captured during the first sample

U2 = fish captured during the second sample

The probability of capture (P) is estimated by using:

$$P=1-(U2/U1).$$

Results from calculation using this formula suggest that if more fish are captured during

the second pass than the first pass a violation of the assumptions has occurred and the population estimate is invalid. Also if no fish are captured during a second pass a capture probability of 100 has occurred and all fish in the population have theoretically been captured. An upper and lower bound was placed on the population estimate. The formula used was:

$$CI' = N \pm 1.96 \sqrt{N(P(1-P))}$$

where:

CI = 95% confidence interval.

In some cases, the lower confidence limit was below the number of fish taken from a survey reach. In such cases the lower limit was set at the number of fish, 100 mm and longer of a particular species, captured from the stream section.

Condition factors were calculated to determine fish health. Use of condition factors depends on the assumption of isometric growth (Cone 1989). Isometric growth is where the slope from a population's weight-length regression equals 3.0.

Several condition indices have been developed to simplify the weight-length relationship into a single parameter, with the most common one being Fulton's Condition Factor (K). The equation Fulton used to determine K is:

$$K = \frac{W}{L^3} * 100000$$

Where W equals weight and L equals total length of each fish captured. Individual condition factors are added together and averaged for comparisons between species and populations.

Interpretation of the condition factor for each population and fish species is relatively easy. Populations with condition factors less than 1 are considered "skinny", while populations with condition factors greater than 1 are considered "plump" (Moyle and Cech, 1988). Species not historically found in an area may displace historic species from preferred habitats or exploit limited resources more effectively than natives (De Staso III and Rahel, 1994; Byorth and Magee, 1998). If these "skinny" fish are the historic species, this makes them more vulnerable to disease, and replacement by competition. A change in more than 5 percent of a condition factor for a population will warrant further detailed analysis.

RESULTS

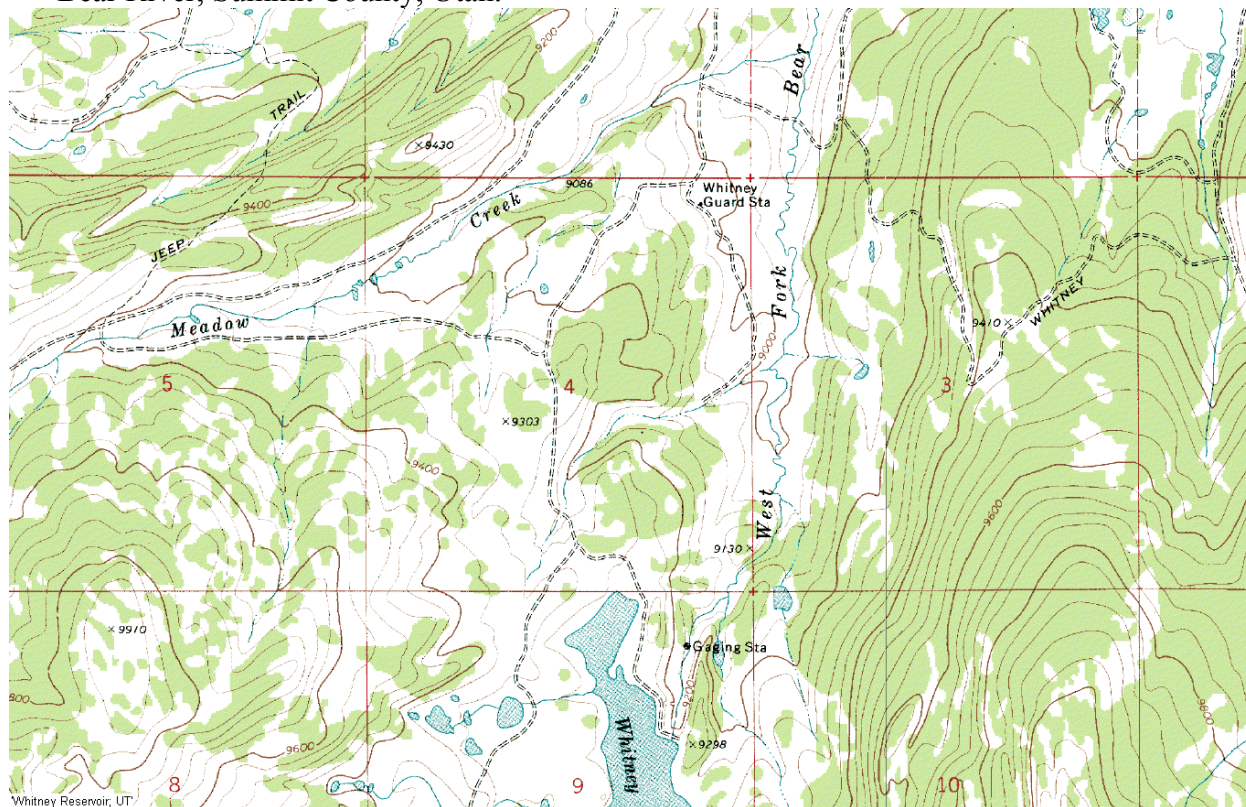
Electrofishing surveys were conducted in eight stream sections on five streams and two

canals on the Wasatch-Cache National Forest in 2001 (Table 1). Most of these were found in the headwaters of the Bear River, south of Evanston, Wyoming. These streams were composed of a number of fish species (Table 1).

West Fork Bear River

The West Fork of the Bear River is a tributary of the Bear River. In 2001 the section just below Whitney Reservoir was resurveyed. This section is located where Forest Road 032 crosses over the stream (Figure 1). The survey section went from the crossing upstream 100 meters. This reach was initially survey on the 29 of August 1994. This section was resurveyed on 7 September of 2001. The West Fork Bear River drains to the north and is located on the north slope of the Uinta Mountains. Activities occurring within the drainage include hunting, fishing, camping, grazing and timber harvest.

Figure 1. A map showing the site sampled during the summer of 2001, on the West Fork of the Bear River, Summit County, Utah.



No change has occurred in the species composition over the past six years. The survey section continues to provide habitat for cutthroat trout and sculpin. Water temperature at the time of electrofishing the section was 52 °F at about 10 in the morning. The total length of the cutthroat trout ranged from 42 mm to 307 mm, in 2001, compared to 41 mm to 240 mm, in 1994, and averaged 131 mm and 117 mm, respectively (Figure 2, 3). Their weight ranged from less than 1 g to 320 g in 2001 and less than 1 g to 162 g in 1994 and averaged 31.2 g and 20.1 g

respectively. Overall, there appears to be fewer fish in 2001 compared to 1994. Biomass per 100 meters of stream appears to be down from 1994 (see Appendix). Biomass for cutthroat trout was 1,187g in 2001 a drop of 397g (0.88 lbs) from the 1994 level of 1,584g. Condition factors also appear to be down for the cutthroat trout over 100 mm. In 1994 the condition factor was 0.99. In 2001 it was 0.85. This may reflect the drought conditions that have existed over the past few years.

Figure 2. Cutthroat trout size class distribution in the West Fork of the Bear River in 1994. Sculpin were also collected but not reflected in the graph.

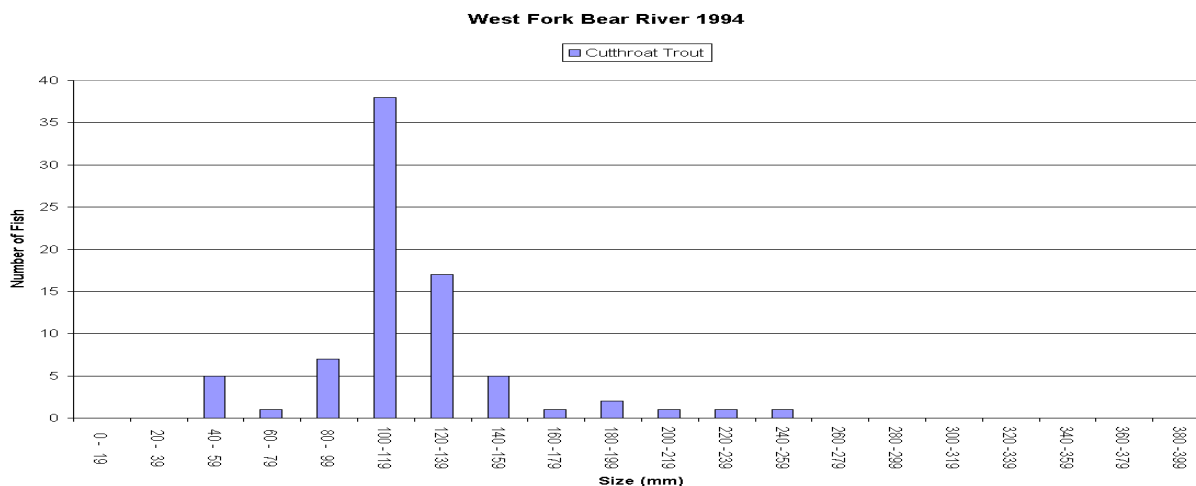
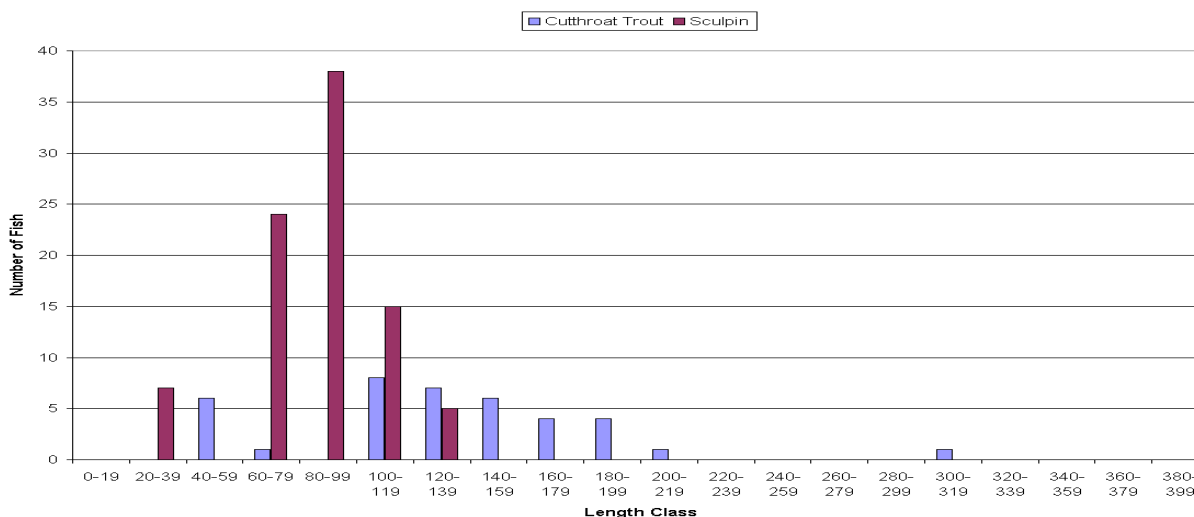


Figure 3. Cutthroat trout size class distribution from the West Fork of the Bear River in 2001.

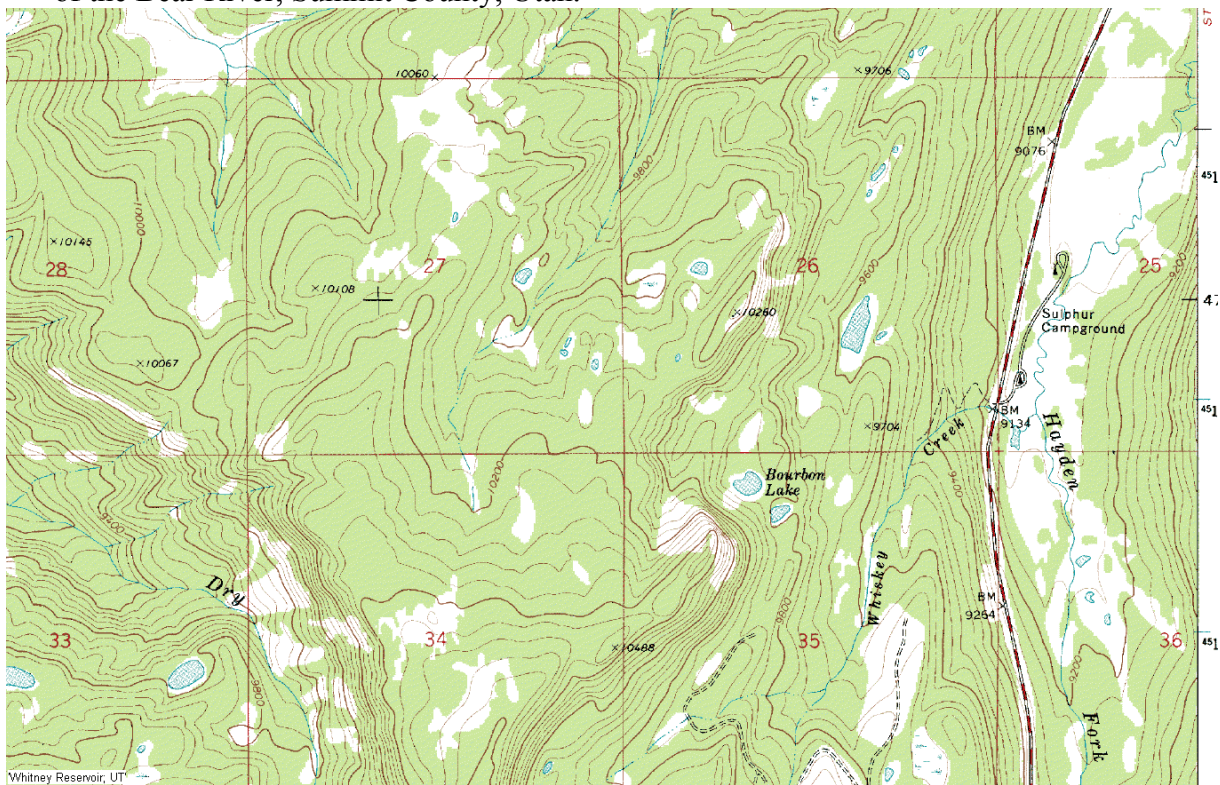


During a field trip this year, brook trout were seen above Whitney Reservoir.

Hayden Fork (Middle)

The Hayden Fork is a tributary of the Bear River and flows north out of the Uinta Mountains and parallels to State Highway 150. Activities occurring within the drainage include hunting, fishing, camping, grazing and timber harvest. Tie hacking (railroad tie cutting), also occurred within the drainage as evidenced by the existence of two tie hack dams and the remains of cabins. In 2001 the section just above the mouth of Whiskey Creek was resurveyed (Figure 4). This section is located just upstream of Sulphur Camp Ground. The survey section went from the mouth of the tributary upstream 100 meters. In 1994 the survey was conducted on the 29 of August. In 2001 the survey was conducted on 7 September.

Figure 4. A map showing the site sampled during the summer of 2001, on the middle Hayden Fork of the Bear River, Summit County, Utah.



Fish capture within this section during the 1994 and 2001 surveys included brook, hatchery rainbow, and cutthroat trout, mountain whitefish and sculpin (Table 2).

Table 2. Fish species collected just upstream of the mouth of the tributary from Whiskey Creek in the Hayden Fork, Summit County, Utah.

	Rainbow Trout	Brook Trout	Cutthroat Trout	Whitefish	Sculpin
1994 Survey	3 (5%)	35 (53%)	2 (3%)	1 (2%)	25 (38%)
2001	3 (5%)	33 (52%)	11 (17)	3 (5%)	14 (22%)

Survey					
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No change has occurred in the species composition over the past six years. The percentages that make up the species composition does appear to have changed with more cutthroat and whitefish being found in the section.

Water temperature at the time of electrofishing the section was 52°F at about 10 in the morning. The total length of the cutthroat trout ranged from 96 mm to 260 mm, in 2001, compared to 145 mm to 282 mm, in 1994, and averaged 158 mm and 214 mm, respectively (Figure 5, 6). Their weight ranged from less than 1g to 320g in 2001 and less than 26g to 175g in 1994 and averaged 68g and 101g respectively. Overall, there appears to be about the same number of fish in 2001 compared to 1994. Biomass for all fish in the survey section per 100 meters of stream appears to be up from 1994 (Appendix). Condition factors also appear to be about the same if not up from the survey in 1994. This may reflect the elimination of stocking in the area starting in 2001.

Figure 5. Brook, cutthroat and rainbow trout and whitefish size class distribution in the Hayden Fork of the Bear River in 1994. Sculpin were also collected but not reflected in the graph.

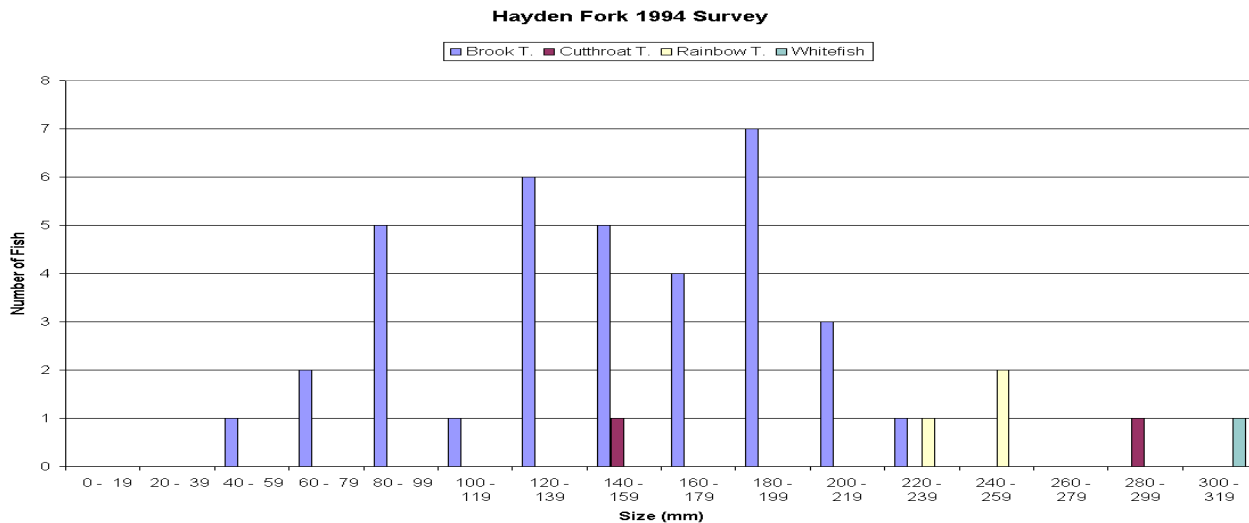
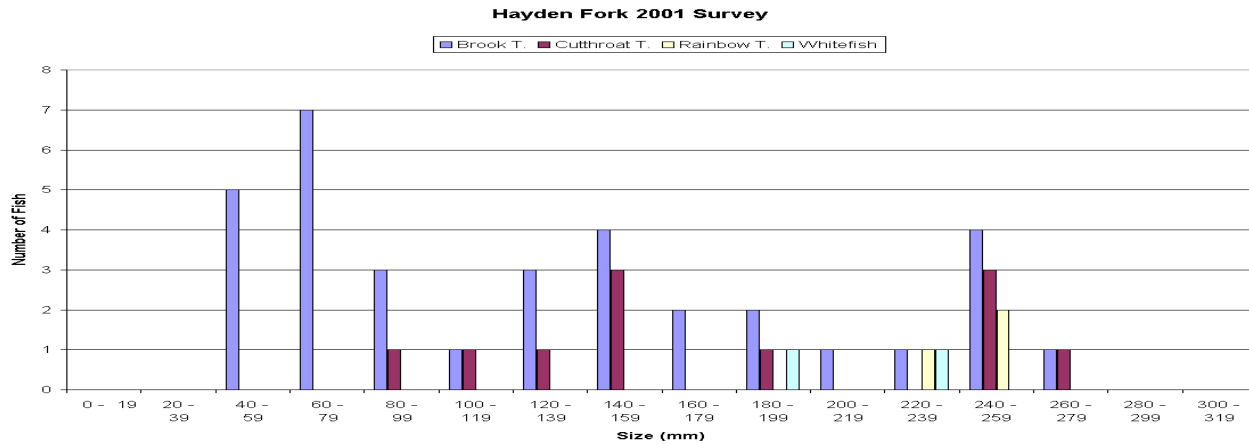


Figure 6. Brook, cutthroat and rainbow trout and whitefish size class distribution in the Hayden Fork of the Bear River in 2001. One whitefish greater than 319 mm was also captured. Sculpin were also collected but not reflected in the graph.



Hayden Fork (Upper)

An upper section in the Hayden Fork was also surveyed in 2001. This section was located where a tributary from Teal Lake empties into the Hayden Fork (Figure 7). It goes upstream from this point 99.6m. This section contained brook and cutthroat trout and sculpin. The brook trout total length ranged from 46 mm to 234 mm and averaged 104.7 mm (4.1 in., Figure 8). Their weight ranged from less to 1 grams to 137 grams and averaged 29.0 grams. The condition factor for fish over 100 mm was 0.99. The cutthroat trout total length ranged from 192 mm to 270 mm and averaged 215.8 mm (8.5 in., Figure 8). Their weight ranged from less to 68 grams to 171 grams and averaged 95.2 grams. The water temperature at the time of electrofishing was 7 °C at 8:00 in the morning.

Figure 7. A map showing the site sampled during the summer of 2001, on the upper Hayden Fork of the Bear River, Summit County, Utah.

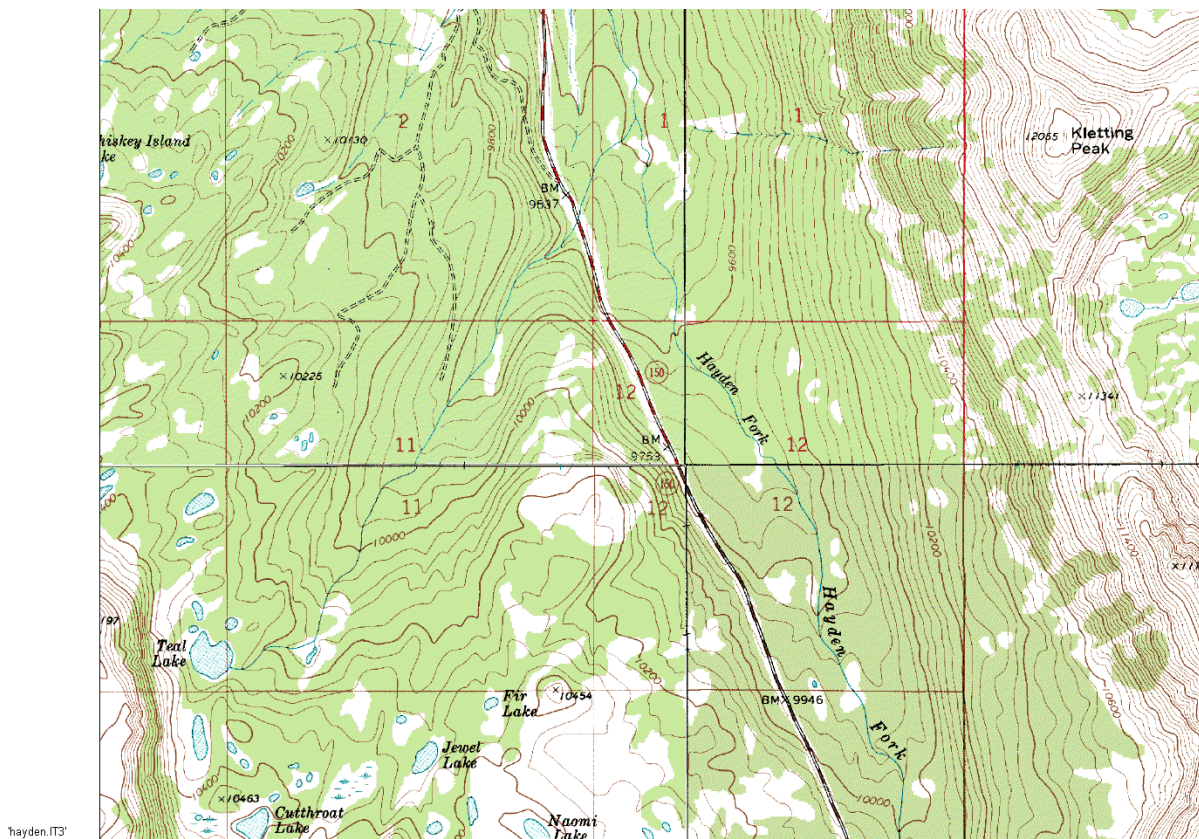
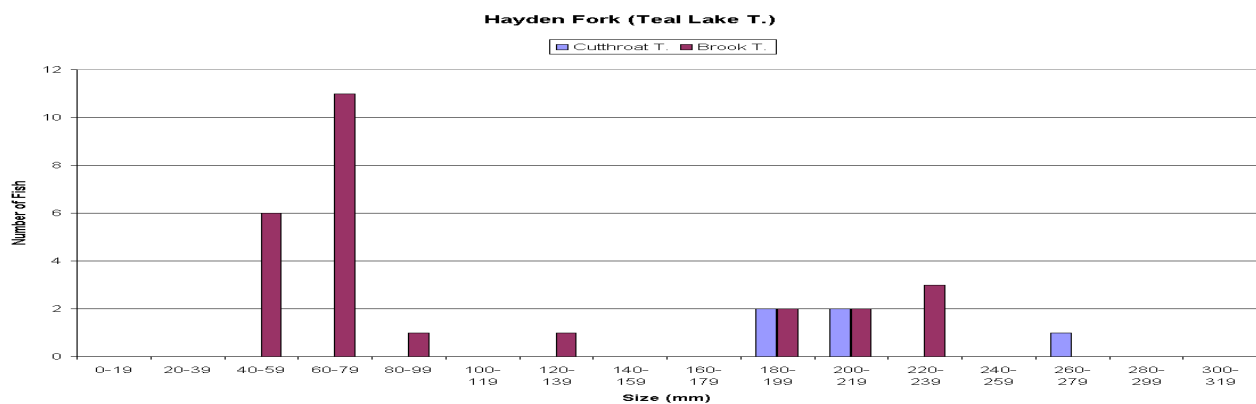


Figure 8. Cutthroat and brook trout size class distribution in the upper end of the Hayden Fork of the Bear River in 2001. Sculpin were also collected but not reflected in the graph.



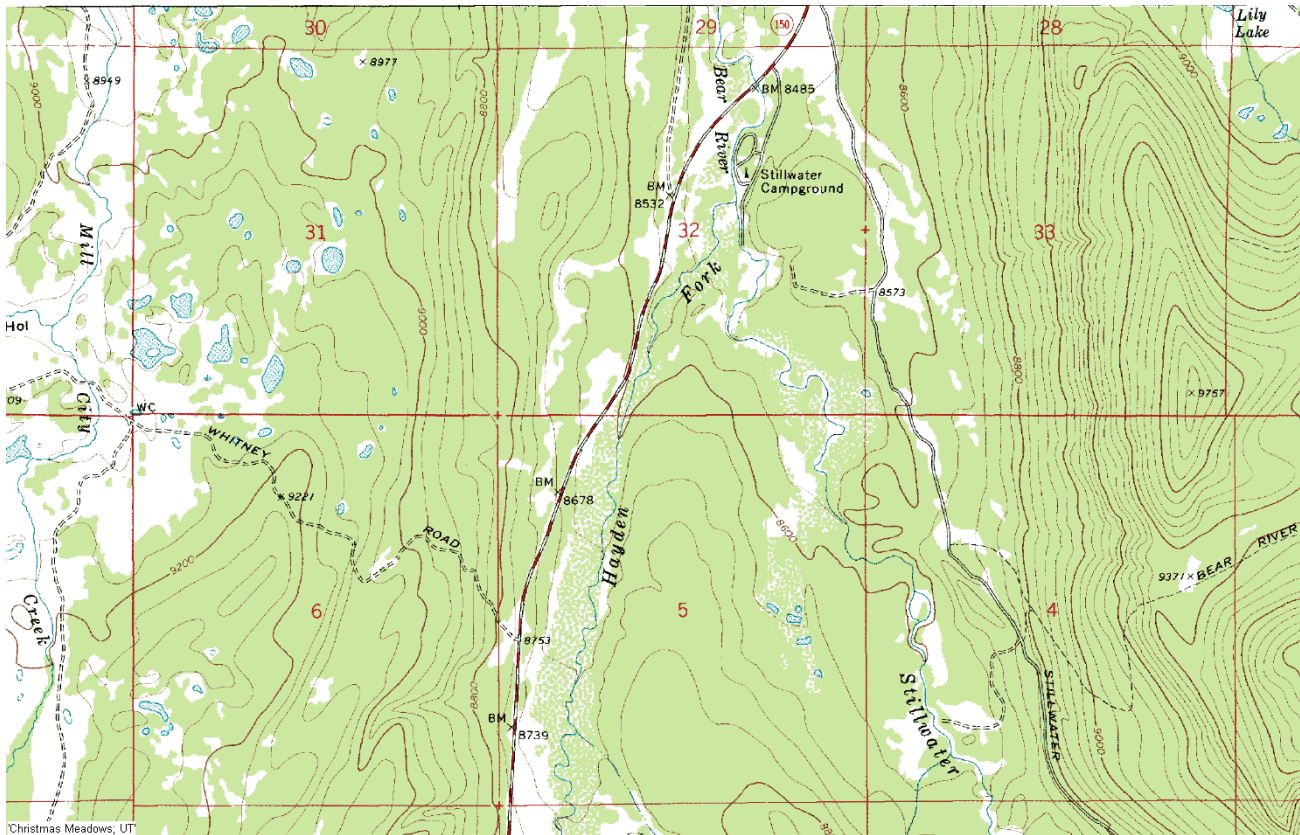
Stillwater Fork

The Stillwater Fork is a tributary of the Bear River and flows north out of the Uinta Mountains. It drains the area to the east of the Hayden Fork. Activities that have and/or do occur in the drainage include tie hacking, timber harvest, hunting, fishing, camping and hiking. In 2001 the section just above the mouth of the stream was surveyed. This section is located approximately 300m upstream of Stillwater Campground (Figure 9). The original section started upstream of upper most campsite and went upstream. In 2001, beavers had flooded this area and so the sample site was moved upstream. This survey was conducted on 12 Sept. 2001. The survey section length was 100 meters with an average stream width of 6.7 m. and a depth of 40 mm. Fish capture just below this section during the 1994 and 2001 surveys included brook, hatchery rainbow, and cutthroat trout, whitefish, mountain sucker and sculpin (Table 3). The species composition in the reach surveyed was 2 rainbow trout, 7 brook trout, 13 cutthroat trout, 1 mountain sucker and sculpin. No whitefish were collected which was a major change from the 1994 survey when whitefish made up 50% of the catch excluding sculpin. Cutthroat numbers also increased while rainbow and mountain sucker numbers decreased.

Table 3. Fish species collected just upstream of the mouth of the Stillwater Fork, Summit County, Utah.

	Rainbow Trout	Brook Trout	Cutthroat Trout	Whitefish	Mountain sucker	Sculpin
1994 Survey	10 (14%)	5 (7%)	1 (1%)	37 (50%)	6 (8%)	Present
2001 Survey	2 (9%)	7 (30%)	13 (57%)	0 (0%)	1 (4%)	Present

Figure 9. A map showing the site sampled during the summer of 2001, on the Stillwater Fork of the Bear River, Summit County, Utah.



Water temperature, at the time of electrofishing the section, was 10 °C at about 10 in the morning. The total length of the cutthroat trout ranged from 51 mm to 284 mm, in 2001, compared to 145 mm to 282 mm, in 1994, and averaged 158 mm and 214 mm, respectively (Figure 10, 11). Their weight ranged from less than 1 g to 320 g in 2001 and 26 g to 175 g in 1994 and averaged 68 g and 101 g respectively. Overall, there appears to be about the same number of fish in 2001 compared to 1994. Biomass for all fish in the survey section per 100 meters of stream appears to be up from 1994. Condition factors also appear to be about the same if not up from the survey in 1994. This may reflect the elimination of stocking in the area starting in 2001.

Figure 10. Fish size class distribution in the Stillwater Fork of the Bear River in 1994. Sculpin were also collected but not reflected in the graph.

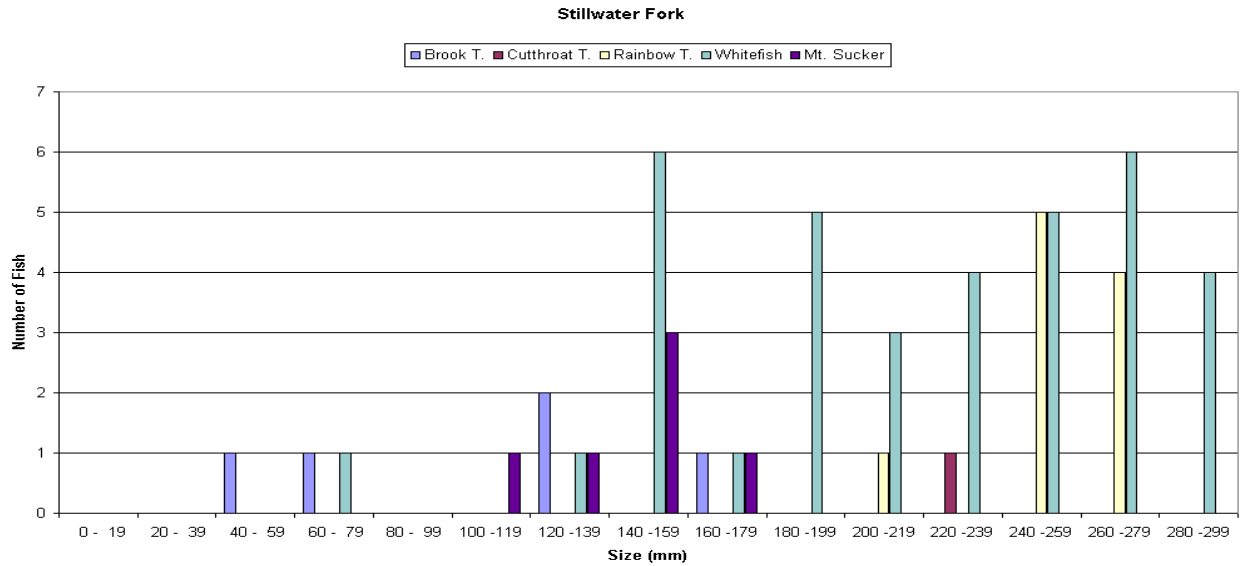
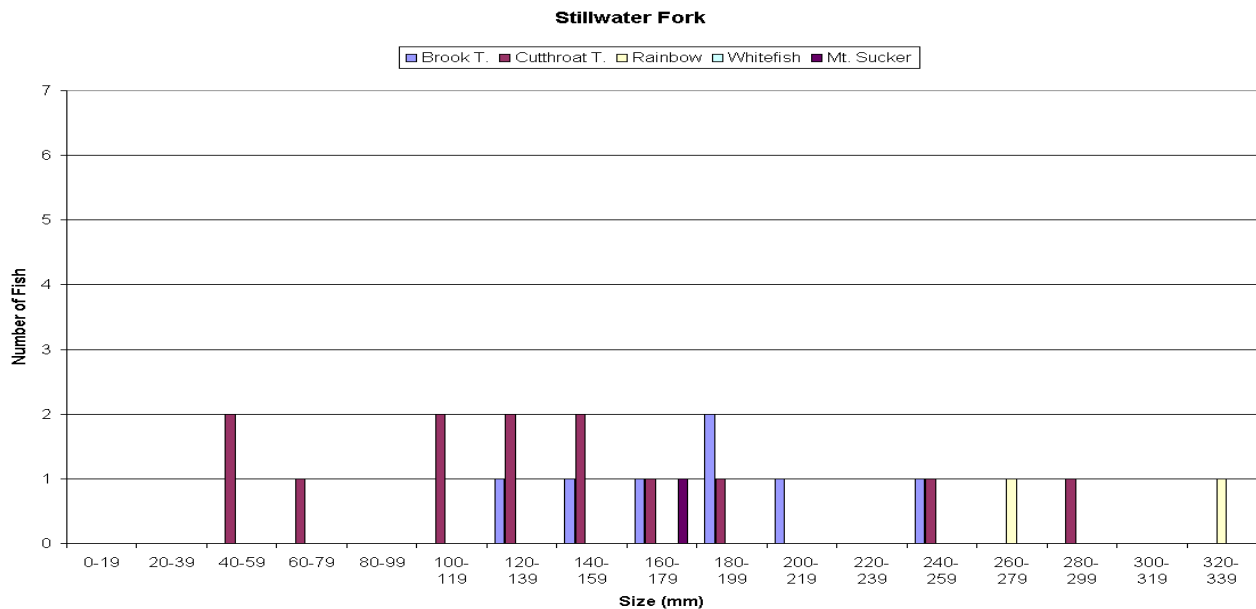


Figure 11. Fish size class distribution in the Stillwater Fork of the Bear River in 2001. No whitefish were collected. Sculpin were also collected but are not reflected in the graph.



Hillard Canal

The Hillard Canal or the lowest or west canal, which drains from the East Fork of the Bear River, was surveyed on 6 of September 2001. This canal is located at UTM coordinate N40° 54.198' W110° 48.872' $\pm 6m$. The surveyed section started at the withdraw gate and went downstream 100 meters (Figure 12). The canal had been shut down, for the winter, at the time of sampling. The water temperature at the time of electrofishing was 13°C at 2:00 in the afternoon.

This section contained brook (23) and cutthroat (17) trout, whitefish (1) and sculpin (26). The brook trout total length ranged from 53 mm to 145 mm and averaged 85 mm (3.3 in., Figure 13). Their weight ranged from less than 1 mm to 29 grams and averaged 9.1 grams. The condition factor for fish over 100 mm was 0.73. The cutthroat trout total length ranged from 32 mm to 143 mm and averaged 85 mm (3.3 in., Figure 13). Their weight ranged from less than 1g to 21 grams and averaged 5 grams. The condition factor for fish over 100 mm was 0.66.

Figure 12. A map showing the site sampled during the summer of 2001, on the Hillard and Hovarka Canals of the East Fork of the Bear River, Summit County, Utah.

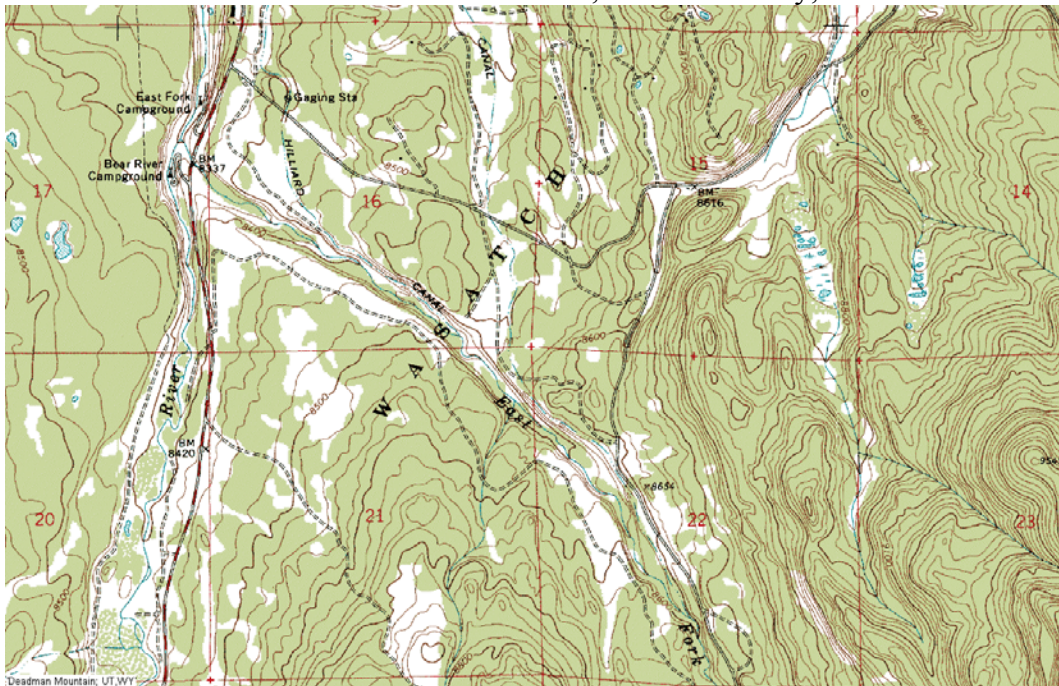
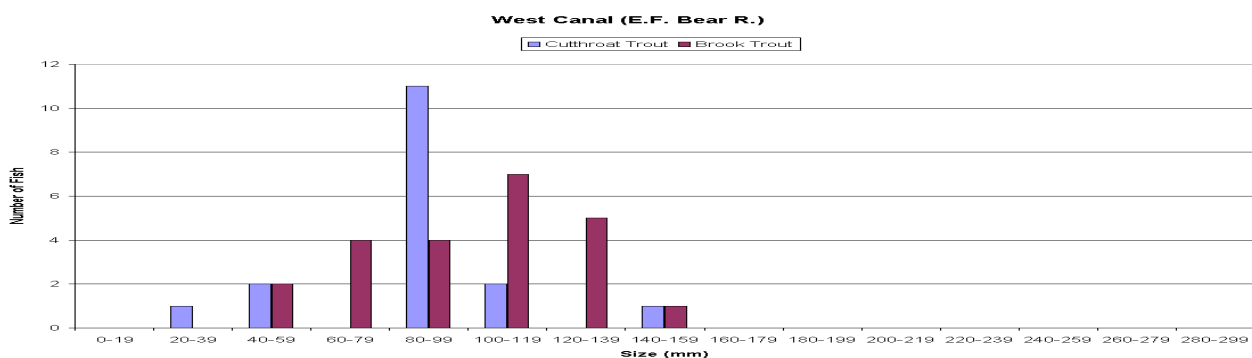


Figure 13. Cutthroat and brook trout size class distribution in the Hillard Canal, East Fork of the Bear River in 2001. Sculpin and a whitefish were also collected but not reflected in the graph.

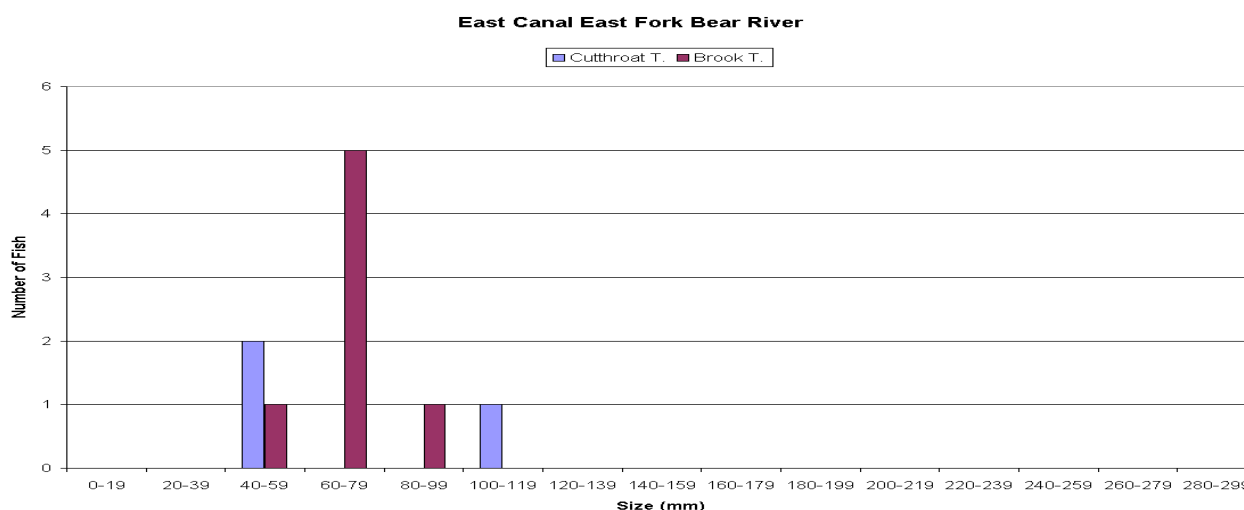


Hovarka Canal

The Hovarka Canal or the upper or east canal that drains from the East Fork of the Bear River was

surveyed on 6 of September 2001. This canal is located at UTM coordinate N40° 53.430' W110° 48.048' \pm 8m (Figure 12). The surveyed section started at the withdraw gate and went downstream 100 meters. The canal was still in operation at the time of sampling. The water temperature at the time of electrofishing was 13 °C at 10:00 in the morning. This section contained brook (7) and cutthroat (3) trout, whitefish (1) and sculpin (60). The brook trout total length ranged from 56 mm to 90 mm and averaged 75 mm (3.0 in., Figure 14). No weights were taken because of their small size. The cutthroat trout total length ranged from 50 mm to 106 mm and averaged 70 mm (2.8in., Figure 14).

Figure 14. Cutthroat and brook trout size class distribution in the Hovarka Canal, East Fork of the Bear River in 2001. Sculpin and a whitefish were also collected but not reflected in the graph.



Middle Fork Weber River

A section in the Middle Fork of the Weber River was also surveyed in 2001. This section was located where the main trail up the drainage crosses the stream about 1.5 miles up from the mouth (Figure 15). It goes upstream, from this point, 100m. This section contained brook and cutthroat trout and sculpin. The brook trout total length ranged from 60 mm to 195 mm and averaged 108.3 mm (4.3 in., Figure 16). Their weight ranged from 2 mm to 65 grams and averaged 24 grams. The condition factor for fish over 100 mm was 0.88. The cutthroat trout total length ranged from 31 mm to 218 mm and averaged 122 mm (4.8 in., Figure 16). Their weight ranged from less than 1 gram to 122 grams and averaged 26 grams. The water temperature at the time of electrofishing was 17° C at 11:00 in the morning.

Figure 15. A map showing the site sampled during the summer of 2001, on the Middle Fork of the Weber River, Summit County, Utah.

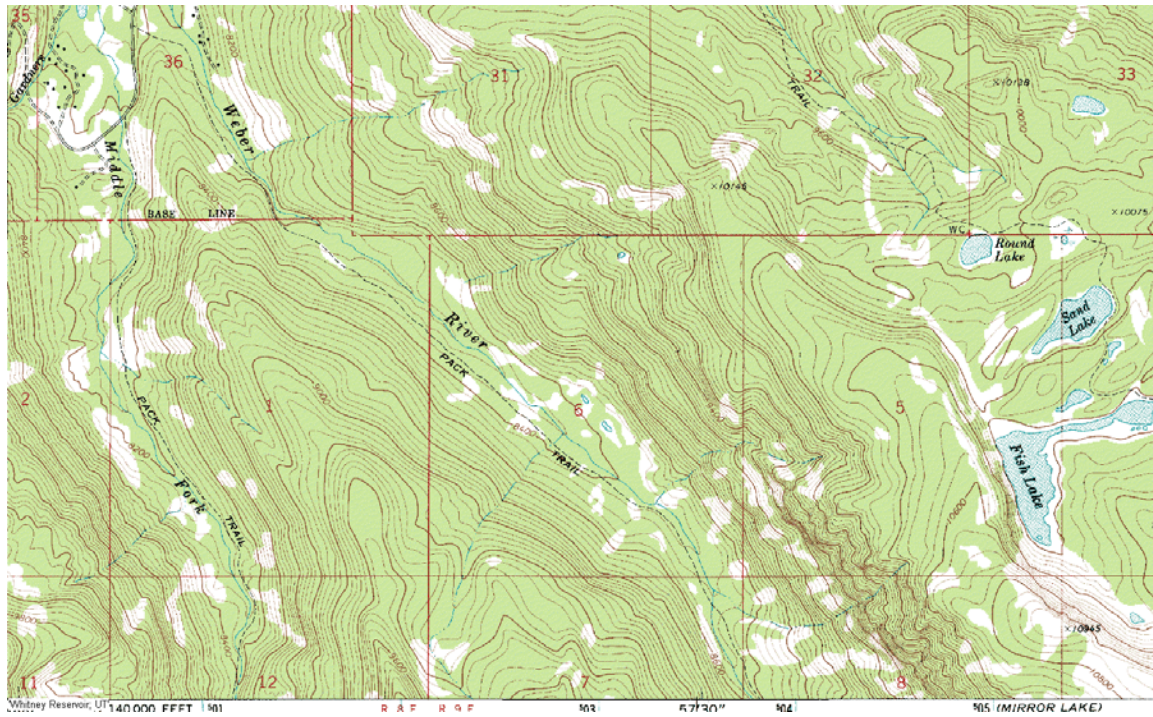
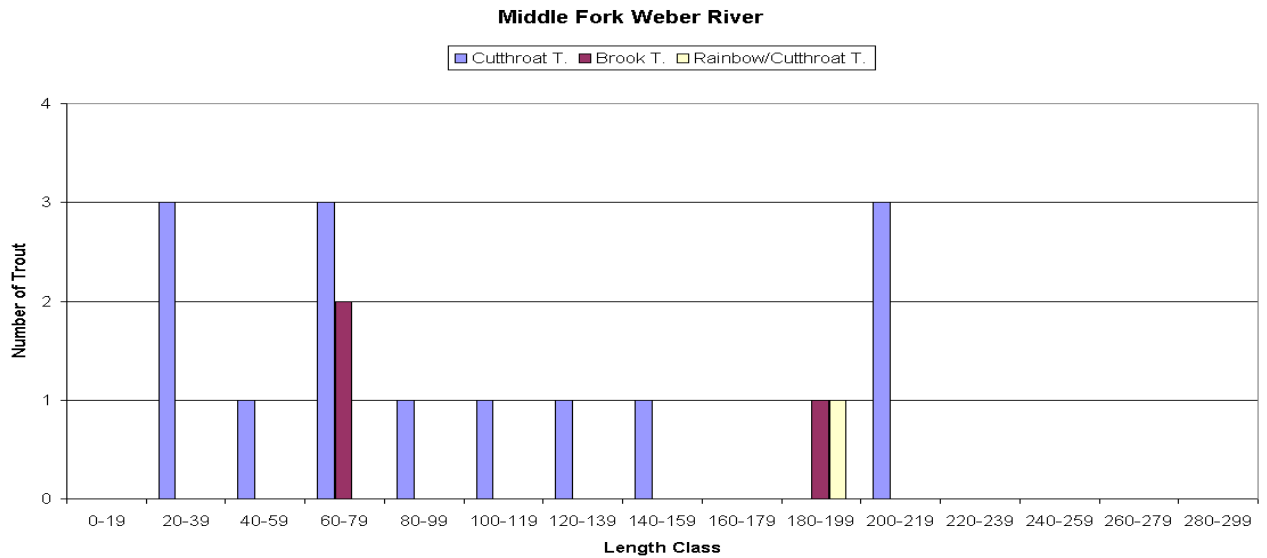


Figure 16. Cutthroat and brook trout size class distribution in the Middle Fork of the Weber River in 2001. Sculpin were also collected but not reflected in the graph.



Duchesne River

A section in the Duchesne River was also surveyed in 2001. This section was located where the tributary from Mirror and Bonnie lakes meet and goes downstream 100 meters (Figure 17). This is about 1 mile below Mirror Lake. This section contained brook and rainbow trout. The brook trout total length ranged from 53 mm to 232 mm and averaged 132 mm (5.2 in., Figure 18). Their weight ranged from less than 1 gram to 127 grams and averaged 33 grams. The condition factor for brook trout over 100 mm was 1.05. The rainbow trout total length ranged from 93 mm to 290 mm and averaged 232 mm (9.1 in., Figure 18). Their weight ranged from 8 grams to 192 grams and averaged 118 grams. The condition factor for the rainbow trout over 100 mm was 0.76. The water temperature at the time of electrofishing was 5° C at 10:00 in the morning.

Figure 17. A map showing the site sampled during the summer of 2001, on the Duchesne River, Duchesne County, Utah.

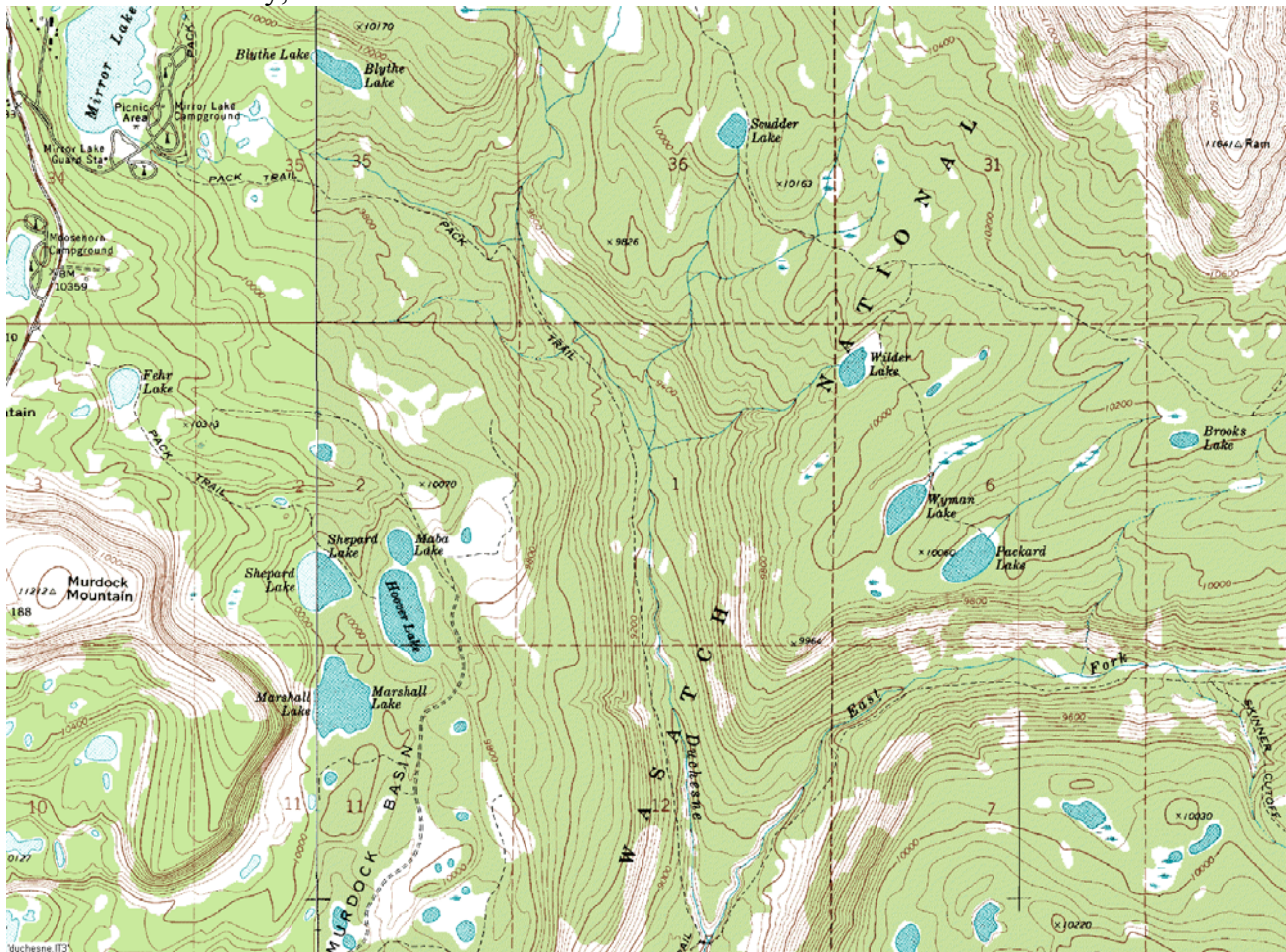
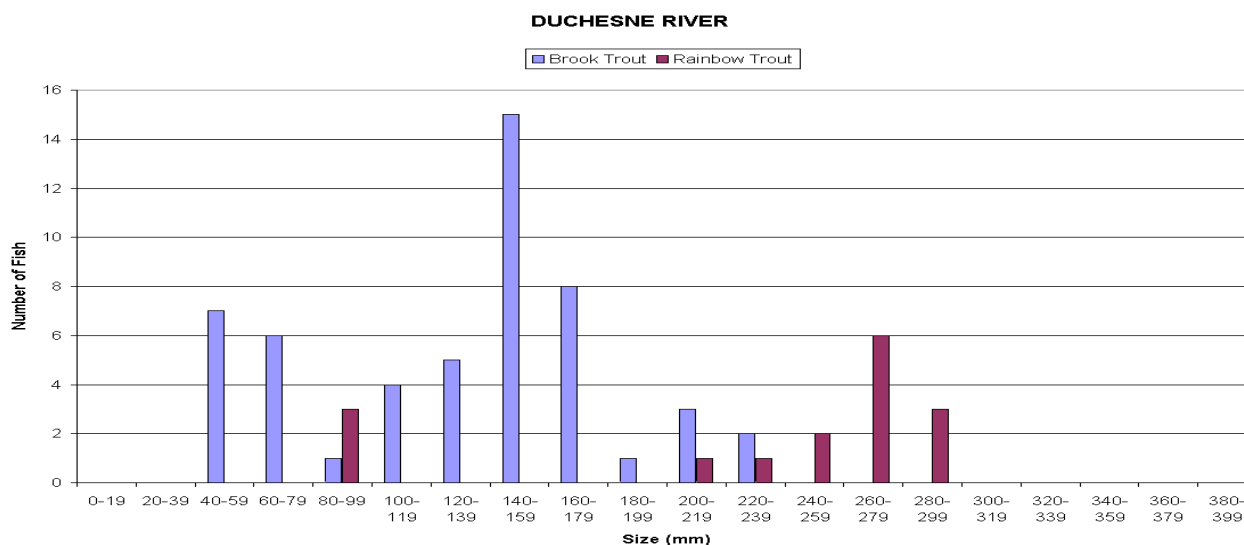


Figure 18. Cutthroat and brook trout size class distribution in the Middle Fork of the Weber River in 2001. Sculpin were also collected but not reflected in the graph.



OPPORTUNITIES AND RECOMMENDATIONS

Opportunities mean many different things to different people. In this report, I have viewed opportunities from a fish management perspective. Ecosystem management principles would suggest that we manage for all resources so as to not lose any one part. In this report I have dealt with mainly fish issues or habitat issues which were obvious at a glance. No habitat surveys were conducted to identify specific habitat projects.

West Fork Bear River

The West Fork of the Bear River provides a number of opportunities for fish management. In the Proposed Forest Plan of the Wasatch-Cache National Forest, the West Fork of the Bear River is identified as a potential expansion site (Wasatch-Cache National Forest. 2001, page 3-150). This area could be made more secure through the removal of fish not historically found in the area or through the stocking of sterile fish. If this were to occur, it is recognized that there is probably not enough spawning areas to meet the harvest wants of recreationalists that visit the area, thus requiring some level of supplementation or a change of harvest limits.

Hayden Fork

There was an increase in cutthroat trout in the middle section of the Hayden Fork in 2001. It is unlikely that this drainage could be effectively treated to remove the fish not historically found the area. This is especially true in the lower half of the drainage where there are a great number of off channel ponds that would have to be treated. The upper portion of the drainage could be treated to remove brook trout inhibiting the area. Additional habitat opportunities will be identified in the habitat survey report to be written in the spring of 2002.

Stillwater Fork

The primary need identified on the lower end of the Stillwater Fork is to minimize riparian impact caused by dispersed camping and ATV use. Some of the dispersed campsites were within 3 meters of the water's edge.

Hillard Canal

To minimize fish loss of fish from the East Fork of the Bear River the Hillard Canal should be screened.

Hovarka Canal

The bed of the Hovarka Canal is primarily gravel. The opportunity to provide some spawning area within the canal exists. A screening device would need to be installed downstream in the canal to minimize the loss of fish. This could be done through installing a rotating drum or a corkscrew screen. At a minimum, the canal should be screened to minimize fish loss.

Middle Fork Weber River

The only opportunity that I noticed while on the Middle Fork of the Weber River to improve fish habitat would be the installation of bridges to cross the stream. The current stream crossings do disturb the streambed and may have a very localized impact to the fish.

Duchesne River

In the Duchesne River Drainage there were three enhancement opportunities identified. The first would be the screening of the tributary coming out of Mirror Lake to prevent stocked fish from migrating out of the lake into the stream. This would provide a greater recreational fishing opportunity. The second opportunity would be to correct the trail problems thus decreasing sediment runoff. The third opportunity would be to chemically treat the tributaries and restock Colorado River cutthroat trout into the drainage. No cutthroat trout were found in the area electro fished.

Discussion

The survey work during 2001 was important in helping the Forest better understand the distribution of fish species on the Forest and how they change over time.

Cutthroat trout numbers were expanded to determine relative density in fish-per-mile of stream (Table 4). This density was determined by dividing the number of cutthroat trout over 100 mm capture in the survey reach by the length of the survey and then multiplying this number by 1,609.34, the number of meters per mile. The population estimates were not used due to the number of stream where a population estimate could not be determined because of failure to meet the assumption of fewer fish being caught during the second pass than the first pass.

The greatest potential threats to the native fish in the Bear River Drainage remain those introduced by man. These include:

- Fish Introductions Bear River Drainage: Yellowstone cutthroat, rainbow and brook trout have been introduced into the Bear River and its tributaries over the past 50 years.

Yellowstone cutthroat trout were stocked in many of the high lake throughout the drainage. Researchers with limited use of meristics, electrophoresis, mitochondria and Nuclear DNA analysis have been unable to identify crossbreeding that may have occurred among the native cutthroat and Yellowstone cutthroat trout (Martin & Shiozawa 1981, Shiozawa and Evans 1995, Shiozawa & Evans 1998). For all practical purposes it probably makes little difference. The cutthroat trout of the Bear River may be offspring of the fish from the Snake River trapped there when historic Lake Bonneville flowed north into the Snake River.

Utah Division of Wildlife Resources continues to rainbow trout in Whitney Reservoir. Over the next few years the Division of Wildlife Resources will be shifting to stocking only sterile rainbow trout.

- Fish Introductions Weber River and Duchesne River Drainages: Yellowstone cutthroat, rainbow and brook trout have been introduced into these tributaries over the past 40 years.
- Fishing can also have a direct impact to cutthroat trout populations. Though it is generally assumed that populations have harvestable surpluses, collection of fish by fishers or scientists can affect populations.
- Habitat alteration from road construction, grazing or recreationalists can affect a population's carrying capacity. Direct mortality can also occur as individuals and animals wade in the streams from May through mid August.

Table 4. Streams sampled in 2001 including species composition, length, width and depth of survey reach and fish densities in fish per mile and fish per 100 meter ².

LOCATION ID #				TROUT OVER 100 mm IN LENGTH								
	DRAINAGE	STREAM	DATE	CUT	CUT/RAIN	RAIN	BRK	Length (M)	Width (M)	Depth (M)	<u>Fish</u> mile	<u>Fish</u> 100M ²
316	BEAR RIVER	West Fork Bear River	07-Sep-2001	30	no	no	no	100	3	0.2	483	10
317	BEAR RIVER	Hayden Fork (middle)	12-Sep-2001	10	no	3	22	100	3.7	0.17	563	9
318	BEAR RIVER	Hayden Fork (upper)	06-Sep-2001	5	no	no	8	100	5.6	0.138	209	2
320	BEAR RIVER	Stillwater Fork	12-Sep-2001	10	no	2	7	100	6.7	0.9	306	3
313	BEAR RIVER	E.F. Bear West Canal	06-Sep-2001	3	no	no	13	100	2	0.07	257	8
314	BEAR RIVER	E.F. Bear East Canal	06-Sep-2001	1	no	no	no	100	2.3	0.11	16	0
319	WEBER RIVER	M.F. Weber River	19-Sep-2001	6	1	no	1	100	10.3	0.15	129	1
315	DUCHESNE RIVER	Duchesne River	11-Sep-2001	no	no	13	38	100	4	2	821	13

CUT=cutthroat trout, RAIN=rainbow trout, BRK=brook trout, BRN=brown trout

Yes=fish species present, No=fish species not present

-- no data collected or calculated

As efforts are made to conserve cutthroat trout throughout the West all things need to be taken into consideration. Historical values are shifting and the need for resource conservation for the future is being recognize. Threats need to be dealt with to minimize future losses. Conservation minded management of public lands for the long-term survival of these native fish is critical. Some would argue that a preservation “hands off” approach is more sound. This “hands off” approach, however, fails to recognize mans introduction of non-native fish, the signification habitat changes which have and continue to occur, and the public demand to see changes occur pace faster than generations.

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APPENDIX